We claim:

1. A phase-locked loop system that provides a loop output signal in response to a reference signal, comprising:

an oscillator network that generates said loop output signal with a frequency that varies in response to a control voltage and to a frequency-determining parameter;

a feedback loop that generates said control voltage in response to the phase difference between said reference signal and a loop feedback signal wherein said feedback loop includes a loop frequency divider that has a divisor N and generates said loop feedback signal in response to said loop output signal;

and

a controller that increments said frequency-determining parameter to maintain said control voltage within a predetermined control-voltage range.

2. The system of claim 1, wherein said controller is configured to monitor said control voltage and increment said frequency-determining parameter each time said control voltage reaches a limit of said control-voltage range.

3. The system of claim 1, wherein said oscillator network includes:

an oscillator that generates an oscillator signal; and

an output frequency divider that has a frequency divisor X and that provides said loop output signal in response to said oscillator signal;

and wherein said frequency divisor X is responsive to said controller so that said frequency-determining parameter is said frequency divisor X.

4. The system of claim 3, wherein said controller is configured to monitor said control voltage and increment said frequency divisor X each time said control voltage reaches a limit of said control-voltage range.

5. The system of claim 1, wherein said controller includes a

comparator that compares said control voltage to said control-voltage range.

6. The system of claim 1, wherein said feedback loop incudes:

a phase detector that generates an error signal in response to the phase difference between said said reference signal and said loop feedback signal;

a charge pump that provides drive currents in response to said error signal; and

a loop filter that generates said control voltage in response to said drive currents.

7. A phase-locked loop system that provides a loop output signal in response to a reference signal, comprising:

an oscillator that generates said loop output signal with a frequency that varies in response to a control voltage and to a frequency-determining parameter;

a feedback loop that generates said control voltage in response to the phase difference between said reference signal and a loop feedback signal wherein said feedback loop includes a loop frequency divider that has a divisor N and generates said loop feedback signal in response to said loop output signal; and

a controller that increments said frequency-determining parameter to maintain said control voltage within a predetermined control-voltage range.

8. The system of claim 7, wherein said controller is configured to monitor said control voltage and increment said frequency-determining parameter each time said control voltage reaches a limit of said control-voltage range.

9. The system of claim 7, wherein said oscillator includes:

a plurality of inverters; and

a plurality of switches that each couple a different number of said inverters in a ring in response to said controller;

said frequency-determining parameter thereby formed by said inverters.

10. The system of claim 9, wherein said controller is configured to monitor said control voltage and command at least one of said switches each time said control voltage reaches a limit of said control-voltage range.

11. The system of claim 7, wherein said oscillator includes a ring of inverters that each have a plurality of resistive loads which can be selected by said controller, said frequency-determining parameter thereby formed by said resistive loads.

12. The system of claim 11, wherein said controller is configured to monitor said control voltage and select at least one of said resistive loads each time said control voltage reaches a limit of said control-voltage range.

13. The system of claim 7, wherein said oscillator includes a ring of inverters that each have a plurality of capacitive loads which can be selected by said controller, said frequency-determining parameter thereby formed by said capacitive loads.

14. The system of claim 13, wherein said controller is configured to monitor said control voltage and select at least one of said capacitive loads each time said control voltage reaches a limit of said control-voltage range.

15. The system of claim 7, wherein said oscillator includes a ring of inverters that each have a plurality of current sources which can be selected by said controller, said frequency-determining parameter thereby formed by said current sources.

16. The system of claim 15, wherein said controller is configured to monitor said control voltage and select at least one of said current sources each time said control voltage reaches a limit of said

control-voltage range.

17. The system of claim 16, wherein said oscillator includes a ring of inverters.

18. The system of claim 7, wherein said oscillator includes a ring of inverters that each includes:

a voltage-to-current converter that provides a tail current in response to said control voltage;

a pair of loads; and

a differential pair of transistors that steer said tail current between said loads in response to a signal from another of said inverters.

19. The system of claim 18, wherein said loads include parallel resistive and capacitive loads.

20. The system of claim 7, wherein said feedback loop incudes:

a phase detector that generates an error signal in response to the phase difference between said reference signal and said loop feedback signal;

a charge pump that provides drive currents in response to said error signal; and

a loop filter that generates said control voltage in response to said drive currents.